CDH1 gene

cadherin 1

Normal Function

The *CDH1* gene provides instructions for making a protein called epithelial cadherin or E-cadherin. This protein is found within the membrane that surrounds epithelial cells, which are the cells that line the surfaces and cavities of the body. E-cadherin belongs to a family of proteins called cadherins whose function is to help neighboring cells stick to one another (cell adhesion) to form organized tissues.

E-cadherin is one of the best-understood cadherin proteins. In addition to its role in cell adhesion, E-cadherin is involved in transmitting chemical signals within cells, controlling cell maturation and movement, and regulating the activity of certain genes. E-cadherin also acts as a tumor suppressor protein, which means it prevents cells from growing and dividing too rapidly or in an uncontrolled way.

Health Conditions Related to Genetic Changes

breast cancer

Inherited mutations in the *CDH1* gene increase a woman's risk of developing a form of breast cancer that begins in the milk-producing glands (lobular breast cancer). In many cases, this increased risk occurs as part of an inherited cancer disorder called hereditary diffuse gastric cancer (HDGC) (described below). Inherited mutations in the *CDH1* gene are thought to account for only a small fraction of all breast cancer cases.

CDH1 gene mutations also occur commonly in lobular breast cancers in women without a family history of the disease. These genetic changes, known as somatic mutations, are not inherited. Somatic gene mutations are acquired during a person's lifetime and occur only in certain cells in the breast. Some of these genetic changes occur within the gene itself, while others turn off (inactivate) a region of nearby DNA that controls the gene's activity. Researchers believe that the resulting loss of E-cadherin may allow breast cells to grow and divide unchecked, leading to a cancerous tumor. A lack of this protein, which is critical for cell adhesion, may also make it easier for cancer cells to detach from a primary tumor and spread (metastasize) to other parts of the body.

hereditary diffuse gastric cancer

More than 120 inherited mutations in the *CDH1* gene have been found to cause a familial cancer disorder called hereditary diffuse gastric cancer (HDGC). People with

CDH1 gene mutations associated with HDGC have a 56 to 70 percent chance of developing stomach (gastric) cancer in their lifetimes. Women with these mutations also have a 40 to 50 percent chance of developing lobular breast cancer (described above). People with HDGC caused by *CDH1* gene mutations are born with one mutated copy of the gene in each cell. An additional mutation that impairs the normal copy of the *CDH1* gene is needed for cancer to develop. This mutation is a somatic mutation and is present only in cancer cells.

The mutations that cause HDGC often lead to the production of an abnormally short, nonfunctional version of the E-cadherin protein or lead to the production of a protein with an altered structure. The loss of normal E-cadherin prevents it from acting as a tumor suppressor, contributing to the uncontrollable growth and division of cells. A lack of E-cadherin impairs cell adhesion, increasing the likelihood that cancer cells will invade the stomach wall and small clusters of cancer cells will metastasize into nearby tissues. In combination, the inherited and somatic mutations lead to a lack of functional E-cadherin and result in HDGC.

ovarian cancer

prostate cancer

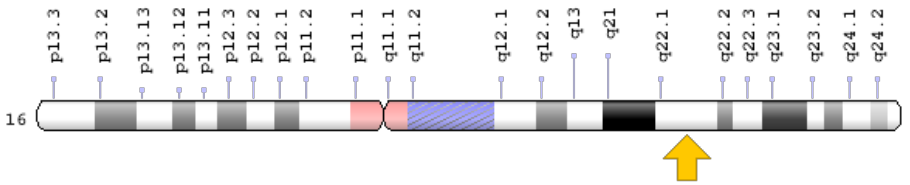
other cancers

Noninherited (somatic) *CDH1* gene mutations are associated with an increased risk of other cancers, including cancers of the lining of the uterus (endometrium) or the ovaries in women, and prostate cancer in men. These *CDH1* gene mutations are thought to result in a nonfunctional E-cadherin protein. A loss of functional E-cadherin in these cells prevents tumor suppression and cell adhesion, leading to rapid cell growth and metastasis. It is unclear why *CDH1* gene mutations affect certain tissues and not others.

Chromosomal Location

Cytogenetic Location: 16q22.1, which is the long (q) arm of chromosome 16 at position 22.1

Molecular Location: base pairs 68,737,290 to 68,835,542 on chromosome 16 (Homo sapiens Annotation Release 108, GRCh38.p7) (NCBI)



Credit: Genome Decoration Page/NCBI

Other Names for This Gene

- Arc-1
- CADH1_HUMAN
- cadherin 1, E-cadherin (epithelial)
- cadherin 1, type 1
- cadherin 1, type 1, E-cadherin (epithelial)
- calcium-dependent adhesion protein, epithelial
- CAM 120/80
- CD324
- CDHE
- cell-CAM 120/80
- E-cadherin
- ECAD
- LCAM
- liver cell adhesion molecule
- UVO
- uvomorulin

Additional Information & Resources

Educational Resources

- Developmental Biology (sixth edition, 2000): Cadherins and Cell Adhesion
  https://www.ncbi.nlm.nih.gov/books/NBK10021/#A385
- Molecular Biology of the Cell (fourth edition, 2002): Cadherins Have Crucial Roles in Development
  https://www.ncbi.nlm.nih.gov/books/NBK26937/#A3516
- National Cancer Institute: Genetics of Breast and Gynecologic Cancers (PDQ)
  https://www.cancer.gov/types/breast/hp/breast-ovarian-genetics-pdq

GeneReviews

- Hereditary Diffuse Gastric Cancer
  https://www.ncbi.nlm.nih.gov/books/NBK1139

Scientific Articles on PubMed

- PubMed
  https://www.ncbi.nlm.nih.gov/pubmed?term=%28%28CDH1%5BTI%5D%29+OR+%28E-cadherin%5BTI%5D%29%29+AND+%28%28Genes%5BMH%5D%29+OR+%28Genetic+Phenomena%5BMH%5D%29%29+AND+english%5Bla%5D+AND+human%5Bmh%5D+AND+%22last+360+days%22%5Bdp%5D

OMIM

- CADHERIN 1
  http://omim.org/entry/192090

Research Resources

- Atlas of Genetics and Cytogenetics in Oncology and Haematology
  http://atlasgeneticsoncology.org/Genes/CDH1ID166ch16q22.html
- Cancer Genetics Web
  http://www.cancerindex.org/geneweb/CDH1.htm
- ClinVar
  https://www.ncbi.nlm.nih.gov/clinvar?term=CDH1%5Bgene%5D
- HGNC Gene Family: CD molecules
  http://www.genenames.org/cgi-bin/genefamilies/set/471
- HGNC Gene Family: Type I classical cadherins
  http://www.genenames.org/cgi-bin/genefamilies/set/1185
- HGNC Gene Symbol Report
  http://www.genenames.org/cgi-bin/gene_symbol_report?q=data/hgnc_data.php&hgnc_id=1748

- NCBI Gene
  https://www.ncbi.nlm.nih.gov/gene/999
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